Application No. 09/746,600

<u>VERSION WITH MARKINGS TO SHOW CHANGES MADE</u>

<u>IN THE SPECIFICATION</u>:

The paragraph extending from page 11, line 16 through page 12, line 2 has been amended as follows:

Figs. 1(a) and 1(b) are views illustrating the construction of an AT cut high frequency crystal resonator according to the invention, and Fig. 1(a) being a plan view thereof and Fig. 1(b) being a sectional view taken along a line Q-Q. On a flat-surface side of a crystal plate 1 the other surface of that has formed therein a recess, there is disposed a main electrode (an excitation electrode) 2. From the electrode 2 there is extended toward an edge of the <u>crystal</u> plate 1 a lead electrode 3. Further, a second electrode 5 is so provided as to surround the peripheral edge of the main electrode 2 with a gap 4 in between. The size of the electrode 5 is made substantially the same as that of the recess 6 formed in the [substrate] <u>crystal plate</u> 1. And, on a recess side there is formed an entire electrode (an excitation electrode) 7.

The last paragraph bridging pages 13 and 14 has been amended as follows:

Setting the center of the main electrode 2 to be the origin (0) and the dimensions of the respective electrode portions to be as stated previously as illustrated in Fig. 1(b) and assuming that the crystal plate 1 be an isotropic elastic body, one dimensional analyses of the thickness shear mode were performed. In the Japanese Patent Application Laid-Open No. Hei-9-27729 that is previously cited, analysis is made using the frequency equation that has been established under the assumption that the edge of the [plate 1] <u>substrate</u> be a free edge. However, in the case of a resonator wherein the periphery of the vibration portion is retained by the annular surrounding portion as in the invention, the frequency equation should be established under the assumption that the edge of the vibration portion be a fixed edge. Accordingly, the frequency equation is as follows.

The last paragraph on page 18 has been amended as follows:

Fig. 5 is a plan view illustrating the main electrode and second electrode constituting a main part of the piezoelectric resonator according to a third embodiment of the present invention. The difference of Fig. 5 from Fig. 1 is that an elliptic main electrode (an excitation electrode) 2a is disposed as the main electrode (excitation electrode) 2 illustrated in Fig. 1(a). This difference further resides in that an elliptic groove hole is formed in the central part of the plate so as to surround the peripheral edge of the main electrode 2a with a gap. That difference further resides in that a second electrode 5a substantially corresponding to the recess 6 of the [piezoelectric] crystal plate 1 is disposed around the main electrode 2a with the elliptic groove hole in between. That an entire electrode is disposed over the recess of the [piezoelectric] crystal plate is the same as in Fig. 1.

Page 19, first full paragraph has been amended as follows:

The reason for having made the main electrode 2a elliptic is as follows. Determining the two-dimensional vibration displacement distribution of the main vibration, as an attempt, by applying a finite element method, it is seen that the displacement distribution of the main vibration is elliptical due to the anisotropy of the crystallographic axis of the [piezoelectric] crystal plate. Therefore, manufacturing a high frequency resonator wherein the main electrode [and second electrode are each] is formed elliptic in conformity with the displacement distribution of the main vibration and the second electrode is formed with an elliptical hole that surrounds the main electrode with a gap formed in between, the production of spurious is suppressed. Resultantly, a resonator whose capacitance ratio is minimal is obtained.

The first full paragraph on page 20 has been amended as follows:

The characterizing feature of the fourth embodiment is as follows. After forming the convex portion T on the [piezoelectric] crystal plate 1 beforehand, the main electrode 2b is formed on the convex portion T. Therefore, even when making the main electrode 2b, lead electrode 3b, and second electrode 5b the same in material quality and in film thickness, the respective cutoff frequencies thereof have the relationship of f1 < f3 < f2. Resultantly, it has become possible to satisfactorily achieve the relevant edge by performing the evaporating or sputtering and photolithography, respectively, only once.

IN THE TITLE:

The title has been amended as follows:

HIGH FREQUENCY PIEZOELECTRIC RESONATOR HAVING REDUCED SPURIOUS MODES.

IN THE CLAIMS:

Claim 2 has been amended as follows:

2. (Amended) A high frequency piezoelectric resonator according to claim 1, wherein the density of the material of the second electrode is made lower than that of the main electrode; and [relevant] dimensional values of the main electrode, second electrode, and gap are set so that an anti-symmetric 0th mode does not become [an] a trapped mode.